AFRICAN JOURNAL OF MEDICINE and medical sciences

VOLUME 36 NUMBER 2 JUNE 2007

ISSN 1116—4077

Afr. J. Med. Med. Sci. (2007) 36, 141-147

Cardiac morbidity in subjects referred for echocardiographic assessment at a tertiary medical institution in the Nigerian savanna zone

MU Sani, KM Karaye and DA Ibrahim

Cardiology Unit, Department of Medicine, Aminu Kano Teaching Hospital, P.M.B. 3452, Kano, Nigeria.

Summary

Cardiovascular diseases constitute a major public health problem both in the developed and developing countries. The profile of morbidity and mortality however, varies between regions and countries and even within countries. The importance of recognizing the cardiovascular conditions that prevail in a particular area is very important in health planning and for improving healthcare services. We therefore set out to describe the cardiac morbidity pattern from our echocardiographic data. Between August 2002 and September 2004 (24 months), we reviewed the echocardiographic diagnosis of all patients aged ³15 years referred for echocardiography. Information obtained from the records included age, gender, names of referring hospital/physician, clinical diagnosis and echocardiogram findings. Data was analyzed using SPSS version 10.0 software. A total of 594 persons were referred for echocardiographic examination in the 2 year study period. Of these, 489 (82.3%) had an abnormal echocardiogram. We analyzed those with abnormal echocardiograms. There were 272 males and 217 females. The male to female ratio was 1.3:1. Hypertensive heart disease was the commonest echocardiographic diagnosis, present in 228 (46.6%) of the patients. This is followed by dilated cardiomyopathy seen in 82 (16.8%) and then rheumatic heart disease in 55 (11.2%). Other findings were Non dilated cardiomyopathy (6.1%), Hypertrophic cardiomyopathy (5.7%), pericardial diseases (3.7%), Ischemic heart disease (4.7%), Cor pulmonale (1.4%) and Endomyocardial fibrosis (0.4%) of patients. It was noted that majority of the cases were advanced with irreversible myocardial damage. Systemic hypertension remains the most important cause of CVD morbidity in savanna region of Nigeria. Addressing the major cardiovascular risk factors especially systemic hypertension will go a long way in reducing the burden of cardiovascular diseases.

Keywords: *Cardiovascular, echocardioograph, morbidity, public health*

Correspondence: Dr. M.U. Sani, Cardiology Unit, Department of Medicine, Aminu Kano Teaching Hospital, PMB 3452, Kano, Nigeria. E-mail: sanimahmoud@yahoo.com

Résumé

Les maladies cardiovasculaires constituent un problème de santé publique important dans les pays développés et sous développés. Le profile de morbidité et de mortalité varie entre les régions, les pays et même dans les zones d'un pays. L'importance de reconnaître les conditions cardiovasculaires qui s attribuent a une zone particulier est très important dans la planification de la santé et l'amélioration des services de santé. Les auteurs de cette étude décrivaient les fréquences de morbidité et mortalité cardiaque des données echocardiographiques entre Août 2002 a Septembre 2004. Le diagnostiques echocardiographiques des patients âgés de plus de 15 ans referés pour l'échocardiographie étaient revues et les informations obtenues des registres étaient analysées utilisant le programme SPSS version 10.0. 594 patients étaient referés pour échocardiographie durant cette période. Quatre cent quatre vingt neuf (82.3%) avaient une échocardiographie anormales donc 272 males et 217 femelles, d une proportion de 1.3 :1. L'hypertension cardiaque était le plus commun echocardiographiques diagnostiquée chez 228 (46.6%) des patients, suivit par la cardiomyopathie dilatée chez 82 (16.8%), et le rhumatisme cardiaque chez 55 (11.2%) ; Autres inclus : la cardiomyopathie non-cardiaque (6.1%), la cardiomyopathie hypertrophique (5.7%), maladies péricardiques (3.7%), ischémie cardiaque (4.7%), cor pulmonaire (1.4%) et la fibrose endomyocardique (0.4%) des patients. Il était remarqué que la majorité des cas était avancé avec une destruction irréversible du myocarde. L'hypertension systémique reste la cause la plus importante des maladies cardiovasculaires en région de savane au Nigeria. En adressant les facteurs à risque spécialement d'hypertension systémique, cela aidera à réduire les menaces de ces maladies cardiovasculaires.

Introduction

Information from a number of developing countries has demonstrated the effects of ecologic and socioeconomic transformations on the profile of non-communicable diseases; with a rising trend in chronic

non-communicable diseases [1]. Cardiovascular disorders constitute a major public health problem in many developing countries. The profile of morbidity and mortality however, varies between regions and countries and even within countries.

Additionally, 85% of the global morbidity and mortality from cardiovascular diseases (CVD) occur in developing countries including those in Sub-Saharan Africa, due to the lack of effective health care systems. In 2001 alone, there were 985 000 deaths from CVD in Africa, chiefly from ischemic heart disease (IHD), cerebrovascular disease and hypertensive heart disease (HHD) [2]. Kano, a state in the Nigerian savanna, where the study was carried out, has been documented to have the highest prevalence of systemic hypertension and the highest mean serum cholesterol levels in Nigeria [3]- two major cardiovascular risk factors.

Recognizing the cardiovascular conditions that prevail in a particular area is important in health planning and for improving healthcare services. We therefore set out to describe the cardiac morbidity pattern from our echocardiographic data at Aminu Kano Teaching Hospital, Kano a major referral and tertiary health centre in the Nigerian Savanna region.

Methodology

This is a retrospective study of the Echocardiography data collected over 24 months period. Between September 2002 and August 2004, we reviewed the echocardiographic diagnosis of all patients aged 15 years referred for echocardiography. The study was carried out at the echocardiography laboratory of Aminu Kano Teaching Hospital, Kano. This laboratory serves the hospital and receives referrals from other hospitals and clinics in Kano as well as neighbouring states such as Jigawa, Katsina and Yobe.

Through out the 24 months period, echocardiography was carried out using HDI 1500 Ultrasound system, by ATL Ultrasound. The machine has facility for M-Mode, 2D and Doppler studies. 2D and Doppler echocardiography were done with 3 – 5 MHz sector transducer. Complete 2D echocardiography examination was performed according to the recommendations of the American Society of Echocardiography (ASE) [4]. M-mode echocardiograms were derived from 2D images. The M-mode cursor on the 2D scan was moved to specific areas of the heart to obtain measurements according to the recommendation of the committee on M-mode standardization of the American Society of Echocardiography [5]. Doppler indices of LV diastolic filling were obtained. Complete Doppler study was done according to the recommendations of the ASE [6]. From the M – mode measurements, indices of LV function were derived. These included shortening fraction, ejection fraction, LV mass, cardiac output and relative wall thickness.

Information obtained from the records includes age, gender, names of referring hospital/ physician, clinical diagnosis and echocardiographic findings. Data was analyzed using SPSS version 10.0 software.

Since the diagnosis of acute myocardial infarction (MI) can not be made based on echocardiography alone, patients with regional wall motion abnormalities in addition to fulfilling the WHO criteria [7] for diagnosing acute MI; 2 out of 3: chest discomfort or pain characteristic of ischaemia, evolutionary changes on serial ECG tracings and typical rise and fall in serum markers of myocardial injury. This is a limitation for the study.

Cardiac hypertrophy was said to occur when the wall thickness, a surrogate of ventricular mass obtained from M-mode image is more than 1.1 cm. Patient was considered to have Hypertrophic cardiomyopathy (HCM) if they had asymmetrical septal hypertrophy (ASH) with a septal-to-free wall thickness ratio of 1.5:1, a small left ventricular cavity, septal immobility, premature closure of the aortic valve and systolic anterior motion of the mitral valve (SAM) if there is left ventricular (LV) outflow obstruction [8]. Dilated cardiomyopathy (DCM) was characterized by ventricular dilation, with normal or decreased wall thickness, and diminution in systolic function involving the left, right, or both ventricles, with the ejection fraction being defined as less than 40% [9].

Endomyocardial fibrosis (EMF) was diagnosed when 2D echocardiography showed dilated atria and thickening and fibrosis of the endocardium, obliterating the apices of the ventricles. The fibrosis also extends in the area behind the posterior leaflet of mitral/tricuspid valve, resulting in mitral/tricuspid regurgitation.

Pericardial thickening was evidenced by increased echogenicity of the pericardial reflection on 2D imaging and as multiple parallel reflections posterior to the LV on M-mode recordings. A pericardial effusion was recognized on 2D echocardiography as a diffuse and symmetric echolucent space adjacent to the cardiac structures

with clear separation between the parietal and visceral pericardium.

Echocardiographic findings associated with cor pulmonale included the presence of a dilated pulmonary artery and dilation and hypertrophy of the right ventricle (RV), diastolic flattening of the interventricular septum and Doppler evidence of pulmonary hypertension [10].

Results

Five hundred and ninety four (594) persons 15 years and above were referred for echocardiographic examination in the 2 year study period. Of these 489 (82.3%) had an abnormal echocardiogram. Analysis of those with abnormal echocardiograms shows that there were 272 males and 217 females (ratio 1.3:1); and their ages ranged from 15 -90 (mean 46.4 ± 16.4) years. Figure 1 showed the age and sex distribution of the study subject. The females were generally younger than the males.

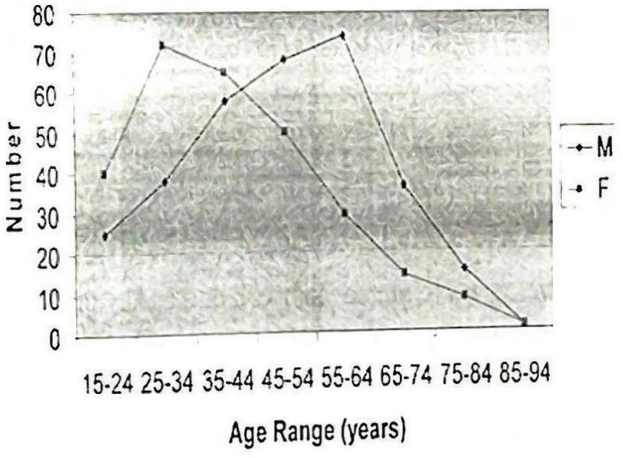


Fig.1:

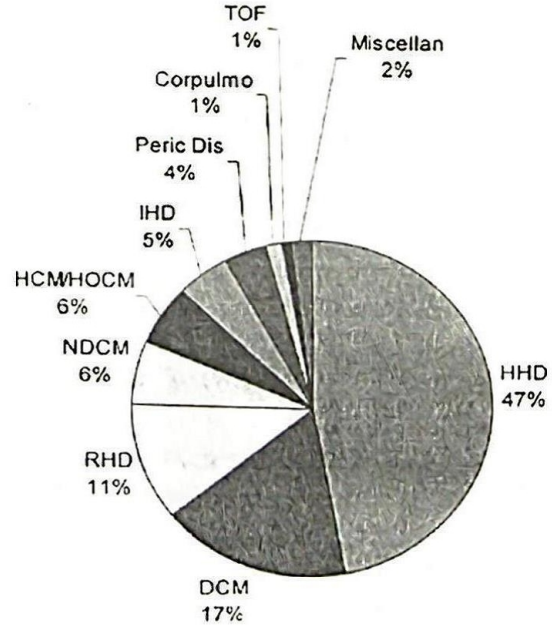
The main clinical indications for the echocardiography included systemic hypertension and hypertensive heart disease (HHD) (45.2%), rheumatic heart disease (RHD) (8.3%), congestive cardiac failure (6.7%), cardiomyopathies (6.3%), chronic renal disease (4.2%), Ischemic heart disease IHD (3.8%), peripartum cardiac failure (2.8%) and cerebrovascular diseases (1.6%).

HHD was the commonest echocardio graphic diagnosis, followed by dialeted cardiography (DCM) and then rheumatic heart disease (RHD).

The distribution of the various cardiac diseases according to sex is shown in Table 1. Figure 2 shows the cardiac morbidity among adults aged 15 years and older in Kano, Northern Nigeria.

Table 1: Cardiac morbidity in Kano, Nigeria among adult population, 15 years and above.

Echo Diagnosis	Mean Age (yrs)	Stand Dev.	M	F	Total	%
HHD	52.9	12.4	145	83	228	46.6
DCM	43.3	16.4	37	45	82	16.8
RHD	27.7	10.6	21	34	55	11.2
NDCM	43.5	12.3	12	18	30	6.1
HCM/HOCM	34.8	11.4	14	14	28	5.7
PERICARD DISEASES	34.9	12.7	12	6	18	3.7
ISCHEMIC CM	59.8	11.4	9	5	14	2.9
ACUTE MI	53.4	9.9	6	3	9	1.8
CORPULMON.	51.3	20.9	5	2	7	1.4
TOF	18.8	6.2	4	1	5	1.0
MV Prosthesis	39.0	1.0	0	2	2	0.4
EMF	33.0	17.0	0	2	2	0.4
MVP	39.5	3.5	1s	1	2	0.4
MV Endocard	73.5	1.5	1	1	2	0.4
Bicuspid AV	32.0	-	0	1	1	0.2
Calcified AS	63.0	-	1	0	1	0.2
AV Prosthesis	32.0	-	0	1	1	0.2
RV Aneurysm	26.0	-	1	0	1	0.2
Restrictive CM	24.0	-	0	1	1	0.2
Total	46.4	16.4	272	217	489	100



previous workers who reported a significant reduction

Fig. 2:

HHD was present in 228 (46.6%) of the patients. Most of these patients (75.4%) had concentric hypertrophy of the left ventricle (Fig.3) while 21.9% had eccentric hypertrophy of the left ventricle. The remaining had other echo-cardiographic evidence of HHD. Diastolic dysfunction was present in 94 (41.2%) of the patients while 41(18%) had both systolic and diastolic dysfunction.

RHD was the diagnosis in 55 (11.2%) of the patients. Eighteen of them (32.7%) had pure mitral regurgitation, 14 (25.5%) had mixed mitral valve disease, 11 (20%) had mixed aortic and mitral valve disease, 8 (14.5%) had pure mitral stenosis and 4 (7.3%) had pure aortic regurgitation. Complications of RHD observed were secondary pulmonary hypertension in 18 (32.7%), valvular cardiomyopathy

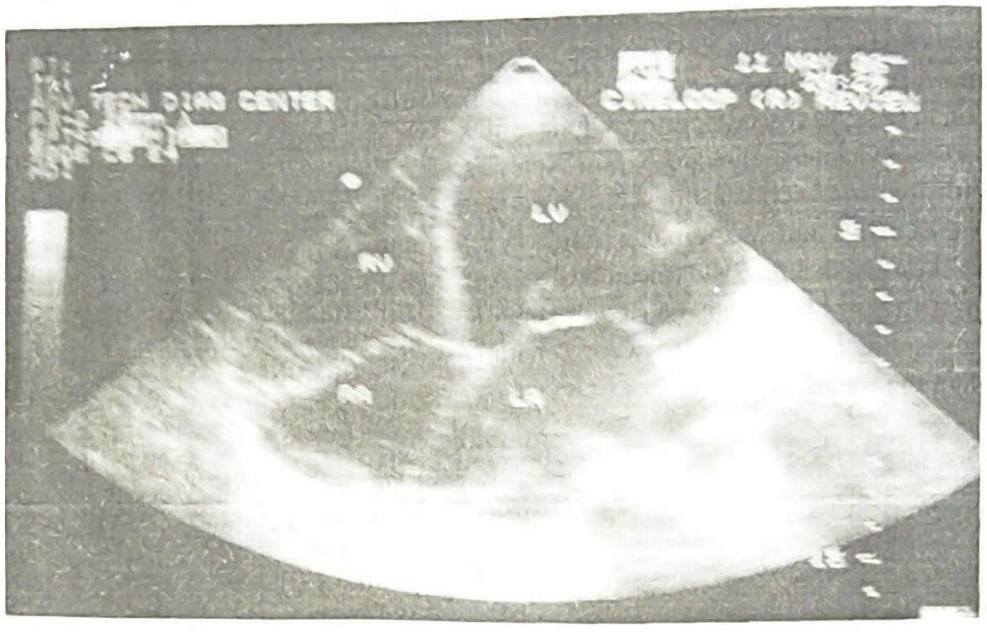


Fig. 3:

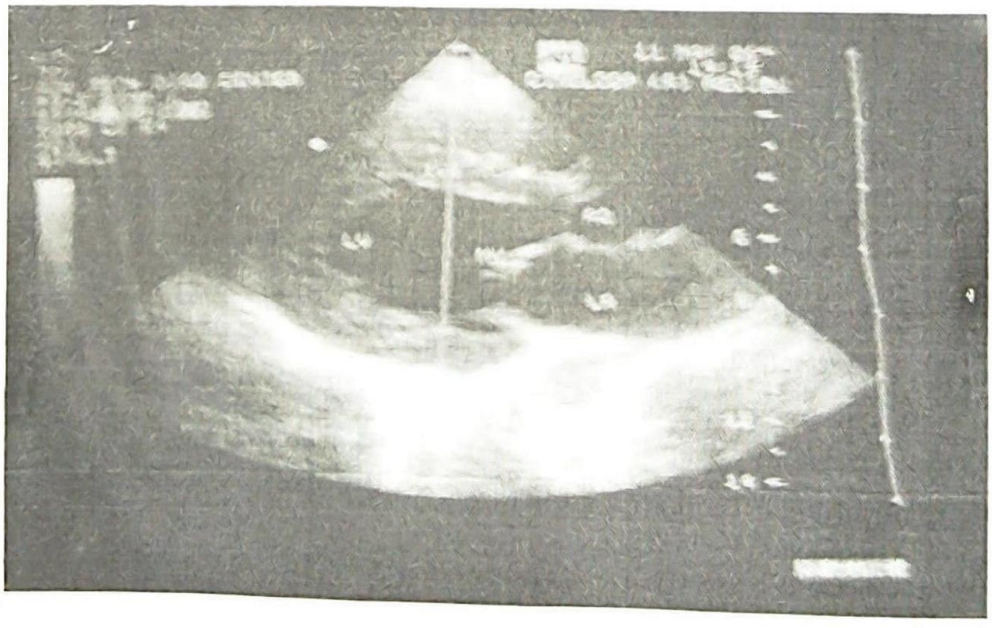


Fig. 4:

DCM (Fig.4) was seen in 82 (16.8%) of the patients. Twelve of them had intracardiac thrombus, 7 located in the left ventricle, 3 in the right ventricle and one each in both ventricles and left atrium. Nineteen (23.2%) of them had secondary pulmonary hypertension. More females had DCM than males.

in 13 (23.6%) and infective endocarditis in 9 (16.4%) of them.

Non dilated cardiomyopathy (NDCM), that is the occurrence of decreased contractility in the presence of normal chamber dimension was seen in 30 (6.1%) of the study subjects. Other

cardiomyopathies noted were hypertrophic crdiomyopathy (HCM) present in 28 (5.7%) and endomyocardial fibrosis (EMF) present in 2 (0.4%) of patients.

Pericardial diseases occurred in 18 (3.7%). Eleven (61%) had effusive pericarditis, 5 (27.8%) had pericardial thickening and 2 (11.1%) had effusive constrictive pericarditis. Cor pulmonale was present in 7 (1.4%) of the study population.

Ischemic heart disease (IHD) was present in 23 (4.7%) of the patients. Fourteen (60.9%) were diagnosed to have ischemic cardiomyopathy and the remaining 9 (39.1%) had acute myocardial infarction.

Discussion

Of the 594 persons referred for echocardiography, 105 (17.7%) had a normal echocardiograms. This might probably be due to the fact that referrals for the procedure initially came from all cadres of medical doctors with some of the patients not adequately clinically screened for cardiac disease. Analysis of those with abnormal studies revealed more males than females with M: F ratio of 1.3:1. The slight male preponderance may be because systemic hypertension and HHD, commoner in males [11] were the chief clinical indications for the procedure.

Previous studies on cardiac morbidity from Nigerian Savanna vary in design, largely using clinical rather than more objective echocardiographic diagnosis. Abengowe reviewed retrospective data of hospital admissions for cardiovascular diseases (CVD) almost 30 years ago. He reported that hypertension and its complications were the commonest findings with a prevalence of 45.5%, followed by cardiomyopathies (20.6%) and chronic RHD (14.4%) [12] Similarly, Ladipo *et a*l in a prospective study from Zaria about 30 years ago reported that the commonest causes of heart disease were hypertension, peripartum cardiac failure, 'congestive cardiomyopathy' and RHD [13]. More recently, Opadijo and Omotosho reported from Ilorin in a study of the diagnosis of heart failure, using echocardiography in addition to other tools, that hypertensive heart disease was the commonest cause (70.1%), followed by DCM (20.7%) and then RHD (8%) [14]. Our findings are largely similar to the findings in the above studies. However, in a prospective study of causes of cardiac failure in Katsina, Antony reported that cardiomyopathies were the commonest cause (47%) of cardiac failure in the northern savanna, congestive cardiomyopathy being the predominant type (31%). These were followed by RHD and anemia in the order of prevalence. Hypertension was responsible for only 12% of cases of heart failure in his series [15]. Most of our patients with hypertensive heart disease (75.4%) had concentric hypertrophy of the left ventricular (LV), which differed from the findings of Ajayi and Akinwusi in Ife, who observed a striking tendency for eccentric (asymmetric) rather than concentric LV hypertrophy [16]. The reason for this difference needs to be further investigated, but may be due to possible earlier referral of hypertensive patients for echocardiography in this study.

Echocardiography findings in patients with peripartum heart failure are essentially that of dilated heart with depressed left ventricular function [17]. These patients even though small in number, 13 (2.8%) might have contributed to DCM becoming the second most prevalent cardiac disease in this study.

The pattern of valvular affectation is the same as the ones reported in earlier studies in Nigeria [18,19] with mitral regurgitation being the commonest form of RHD.

We observed the occurrence of depressed systolic function and with normal or near normal left ventricular sizes in 6.1% of our patients. This has variously been described as non-dilated cardiomyopathy (NDCM) or mildly dilated cardiomyopathy by Iida *et al* [20]. This form of cardiomyopathy was also described as latent DCM by Kurozimi *et al* [21]. NDCM would probably fall under unclassified cardiomyopathies in the World Health Organization/International Federation and Society for Cardiology (WHO/IFSC) task force on the definition and classification of cardiomyopathies [22]. In Nigeria NDCM was reported by Okeahialam *et al* to occur in 4.6% of patients undergoing echocardiography in Jos [23]. The significance of NDCM is that it is not completely innocuous, and identifying patients at this stage has the advantage of initiating preventive and curative interventions.

We observed one of the highest prevalence rates in the country for HCM. Using similar diagnostic criteria, it was 28/489 (5.7%) in this study compared for example to 14/712 (2.0%) reported from Lagos. endomyocardial fibrosis (EMF) that was thought not to occur in the savanna has now been shown to occur in this region [24,25]. We found 2 (o.4%) of our patients to have EMF, a much lower prevalence than

that documented in other parts of the Nigerian savanna [24, 25].

Previous studies on heart disease in the savanna region of Nigeria have documented that ischemic heart disease was either encountered only in non Africans [12] or non existent [13]. Although the prevalence remains low, studies have shown a rising incidence of IHD in Nigeria. The incidence of acute myocardial infarction (MI) was said to have risen from 1 in 20,000 to 1 in 10,000 in University College Hospital Ibadan over a 30 year period [26]. More recently, Rotimi *et al* reviewed 79 cases of sudden cardiac death by autopsy and documented 6.3% of them to have acute MI [27]. We observed IHD in 4.7% of our patients undergoing echocardiography. The figure is likely to be higher if other clinical and diagnostic facility were also considered. IHD is no longer absent among Nigerians. The prevalence may be low now but social changes are taking place which may be expected to lead to an increase in IHD morbidity in the next few years.

Overall the pattern of cardiac morbidity in the Nigerian savanna region highlights the importance of systemic hypertension and its resultant complications. It also shows the new and changing disease spectrum seen in developing countries where though diseases like RHD have remained quite prevalent, the burden of non communicable diseases is steadily increasing. This calls for a review of strategies in disease control that not only involves conventional immunizations and improved environmental sanitation, but also involves adoption of healthy lifestyles and early detection and treatment of non communicable diseases. It is clear from this study that addressing the major cardiovascular risk factors especially systemic hypertension will go a long way in reducing the burden of cardiovascular diseases.

References

1. Forrester T, Cooper RS and Weatherall D. Emergence of western diseases in the tropical world: the experience with Chronic Cardiovascular Diseases. Br Med Bull. 1998; 54(2): 463-473.
2. Integrated management of cardiovascular risk: a report of a WHO meeting, Geneva 9-12 July 2002. NLM classification: WG 166.
3. Non-Communicable Diseases (NCD) in Nigeria – final report of a national survey. Federal Ministry of Health – National Expert Committee on NCD, 1997
4. Henry WL, DeMaria A, Gramiak R, *et al*. Report of the American Society of Echocardiography (ASE) Committee on Nomenclature and Standards in Two Dimensional Echocardiography. Circulation. 1980; 62:212-217.
5. Sahn DJ, DeMaria A, Kisslo J and Weyman A. The committee on M-mode standardization of the American Society of Echocardiography. Recommendations regarding quantitation in M-mode echocardiography; results of a survey of echocardiography measurements. Circulation. 1978; 58:1072-1083.
6. Quinones MA, Otto CM, Stoddard M, *et al*. Recommendations for Quantifications of Doppler Echocardiography. A report from the Doppler Quantification Task Force of the Nomenclature and Standards Committee of the American Society of Echocardiography (1996)
7. Expert Committee on Cardiovascular Diseases and Hypertension. Hypertension and coronary heart disease: Classification and criteria for epidemiological studies. WHO 1959; 168:3
8. Shapiro LM and McKenna WJ. Distribution of left ventricular hypertrophy in Hypertrophic cardiomyopathy: A two-dimensional echocardiographic study. J Am Coll Cardiol 1983;2:437-444
9. Feild BJ, Baxley WA, Russell Jr RO, *et al*. Left ventricular function and hypertrophy in cardiomyopathy with depressed ejection fraction. Circulation 1973; 47:1022-1031.
10. Jaffe CC and Weltin G. Echocardiography of the right side of the heart. Cardiol Clin 1992;10:41-57
11. Olatunbosun ST, Kaufman JS, Cooper RS and Bella AF. Hypertension in a black population: prevalence and biosocial determinants of high blood pressure in a group of urban Nigerians. J Hum Hypertens. 2000 Apr; 14(4):249-257.
12. Abengowe CU. Cardiovascular disease in Northern Nigeria. Trop Geogr Med. 1979; 31(4): 553-560.
13. Ladipo GU, Froude JR and Parry EH. Pattern of heart disease in adults of the Nigerian Savanna: a prospective clinical study. Afr J Med Med Sci. 1977; 6(4): 185-192.
14. Opadijo OG and Omotosho AB. Diagnosis of congestive heart failure (CHF): any role for

Electrocardiography (ECG). Sahel Med J. 2000; 3(2): 74-77.
15. Antony KK. Pattern of cardiac failure in Northern Savanna Nigeria. Trop Geogr Med. 1980; 32(2): 118-125.
16. Ajayi AA and Akinwusi PO. Spectrum of hypertensive heart disease in Nigerians: cross-sectional study of echocardiographic indices and their correlation with treadmill exercise capacity. J Hypertens. 1993 Jan;11(1):99-102.
17. Danbauchi SS. Echocardiographic features of peripartum cardiac failure: the Zaria syndrome. Trop Doct. 2002 Jan; 32(1):24-27.
18. Fadahunsi HO, Coker AO and Usoro PD. Rheumatic heart disease in Nigerian children: clinical and preventive aspects. Ann Trop Paediatr. 1987 Mar; 7(1):54-58.
19. Onwuchekwa AC and Ugwu EC. Pattern of rheumatic heart disease in adults in Maiduguri—north east Nigeria. Trop Doct. 1996 Apr; 26(2):67-69.
20. Iida K, Sugishita Y, Yukisada K and Ito I. Clinical characteristics of cardiomyopathy with mild dilatation. J Cardiol 1990; 20 (2): 301-310
21. Kurozimi H, Yokota Y, Miki T, Emoto R, Nakanishi O, Masuda J *et al.* A trial diagnosis of latent dilated cardiomyopathies. J Cardiol 1987; 17 (4): 779-784
22. Report of WHO/IFSC task force on the definition and classification of cardiomyopathies. Heart Beat 1996; 2:1-2
23. Okeahialam BN and Anjorin FI. Non-dilated cardiomyopathy in Nigerians evaluated by echocardiography. Acta Cardiol. 1998; 53(2): 97-100.
24. Danbauchi SS, Alhassan MA, Oyati AI and Okpapi JU. Endomyocardial Fibrosis in the Savannah region. Trop Card. 2002; 28(111): 43-45
25. Okeahialam BN and Osunkwo DA. Endomyocardial Fibrosis on the Jos Plateau, An Echocardiographic experience. J Med Trop. 2002; 4(1): 28-31
26. Falase AO, Oladapo OO and Kanu EO. Relatively low incidence of myocardial infarction in Nigerians. Trop Card. 2001; 27(107): 45-47
27. Rotimi O, Fatusi AO and Odesanmi WO. Sudden cardiac death in Nigerians—the Ile-Ife experience. West Afr J Med. 2004; 23(1):27-31.

Received: 16/12/04
Accepted: 24/05/07